

MEDICINE IN THE CONTINENTAL ARMY, 1775-1781

RICHARD L. BLANCO, Ph.D.

History Department
State University of New York
Brockport, New York

Although the Revolutionary War has been studied intensively, relatively little information is available about medical care for the Continental army.¹ Physicians, surgeons, and apothecaries during this era had little understanding of disease, and, throughout the struggle, were handicapped by shortages of drugs, instruments, and equipment. Yet the medical men of the Revolution learned to cope with some contagious diseases, suggested sanitary standards for the military, and occasionally won the praise of generals for their deeds on bloody battlefields and in pestilential hospital wards. A summary of their accomplishments—particularly in the better documented northern campaigns—demonstrates that protection of the soldiers' health was vital to the successful conduct of military operations, and that the Revolutionary War may have hastened the professionalization of American medical practice.²

Briefly, what was the state of medicine in late colonial North America? Most physicians had little formal education, and they usually had haphazard apprenticeships. Only a handful attended medical lectures. In an era when licensure for health services was not required, when only King's College in New York and the College of Philadelphia conferred medical degrees, when little regulatory legislation for medical practice existed, it was easy for quacks, the untutored, and for ill-trained apprentices to advertise themselves as qualified to heal a gullible public anxious for cures.

Yet some 400 out of 3,500 practitioners in North America on the eve of the war held medical degrees. The classes they attended in colleges and in private anatomy schools and their grounding in the liberal arts provided some with a broad philosophical approach to medicine. The time spent walking the wards of the Pennsylvania Hospital gave the most fortunate clinical and surgical experience. And Americans won prestige by advanced

training in European medical schools—Paris, Rheims, Leyden, and particularly, Edinburgh, where some 200 Americans attended by 1800. A minority of America's doctors had the training equal to their better European colleagues.

Medical men with General George Washington's troops practiced in an era when few advances occurred in the theory or practice of medicine. Scientific explanations for the etiology of disease were sparse. Chemical knowledge was limited; microscopy was rudimentary; neurology, pathology, and physiology were in their inception, and bacteriology was a century in the future. Opportunities in America to dissect human cadavers were rare; the training of medical personnel was disorganized; not a single medical journal was published in the colonies, and no scientific society in North America pursued medical research. In public health matters, political authorities functioned within a narrow legislative framework, and few administrative arrangements were devised to protect communities from epidemics.

Physicians were impeded by other restraints in addition to the technical limitations of their tools to probe the body and to aid the senses. Due to the speculative pathology of the century, the profession was often unable to heal because of the prevailing ignorance about the causes and treatment of illness, and medical thought was still confined by restrictive theories about the so-called harmony of the human body. Without understanding the bodily changes produced by disease, or an appreciation of the chemical, structural, and functional alterations resulting from sickness, physicians were unable to visualize what was happening to their patients. Diagnoses of common ailments provided surface clues, but physicians remained perplexed about the pathogenesis of disease. Under these circumstances, regardless of the level of a practitioner's education, the treatment for most maladies was similar—depletion and stimulation. Undoubtedly, medical practice in colonial America, as well as in Europe, rested on shaky empirical foundations, and colonists lived in environmental conditions perhaps comparable to "backward" nations of the modern world. To treat the awesome array of diseases that plagued the citizenry, physicians were almost helpless. They had remedies to ward off only scurvy, malaria, and smallpox.³

In contrast to the British and Continental occupational distinctions in the hierarchy of physicians, surgeons, and apothecaries, American physicians usually performed surgery, and they also dispensed drugs. As

surgeons, they performed operations generally restricted to the surface of the body and the extremities. Surgery was concerned basically with cuts, burns, bruises, sprains, boils, abscesses, fractured bones, septic conditions, dislocated joints, and gunshot wounds. More adventuresome surgeons could operate on a harelip, perform tonsillectomies, attempt paracentesis, and cut for stone in the urinary bladder. They performed only two capital operations—trepanning and amputations. Amputations of the limbs were extremely dangerous. One estimate is that 50% of capital operations in 18th century Britain were fatal. Without a means to protect his patients from infection, or a method to relieve him from painful probing, sawing, cutting, and stitching, a surgeon's chances of success were limited. He knew nothing about the nature of infection or about the danger of shock. A surgeon expected a flow of "laudable pus" as essential for healing. He could not operate safely upon the bodily cavities, for anatomical explorations of the thorax and abdomen were far off. Surgery had not yet been affected by contemporaneous discoveries in pathology and physiology. Even established knowledge about the circulation of the blood produced no significant results on the operating table in that era.⁴

Within this seemingly static state of the American medical profession, improvements were underway in education, licensure, and the dissemination of ideas. More courses for aspiring physicians were available. The College of Philadelphia granted its first Bachelor of Medicine diploma in 1768, King's College its first M.D. in 1769, and by 1775 51 American medical degrees had been conferred. New York enacted a medical licensing law in 1760, and in 1772 the Medical Society of New Jersey petitioned its Assembly to require future practitioners to undergo examinations. A wider distribution of European books and journals was occurring, matched by a better comprehension of biology and the nature of epidemic disease. More autopsies were performed, information about morbid anatomy was enlarged, and obstetrics was acquiring some specialization. Even the obligations of physicians were defined by Dr. Samuel Bard of New York in his discourse on professional ethics. Thus, while few dramatic developments in American medicine evolved by 1775, yet in numbers, in training, and in introspection, the profession was gradually improving. The Revolutionary War provided further impetus to this professionalization of medicine.

At the siege of Boston in 1775, regimental militia surgeons from six colonies encountered numerous problems. The 140 medical men who at various times served the 17,000 man army were relatively inexperienced,

the concept of a national medical corps was beyond their comprehension, and, understandably, military and political authorities neglected to assess the difficulties in providing medical care for thousands of troops massed in unhygienic conditions.⁵ From their British opponents and from their own background the Americans learned about military medicine. The patriots acquired information not only about wound surgery and preventive medicine from the British, but the enemy also provided the bureaucratic organization of an army medical department to emulate.

No formal training existed in military medicine, and little progress occurred during that century in wound treatment, a grim, bloody, unscientific affair. Descriptions of probing for a musket ball in a soldier's flesh, or the amputation of his shattered limb appear incredibly gruesome, but the level of surgery for civilians was similar. Chemical anesthetics were unavailable for decades (except for rum and opiates as poor substitutes), and antiseptic techniques in army hospitals were not attempted until 1871. Intense pain and hemorrhage were inevitable, and operations were performed without concern for hygiene. During combat the wounded were removed to safety by comrades ignorant of first aid procedures. Through the tide of battle, casualties could remain on fields littered with corpses for hours, and sometimes days passed before the wounded received attention. Not until the Napoleonic wars was ingenuity applied to providing the wounded with humane transportation. Until then, as at Lexington and Concord, casualties were dragged off by comrades, carried off on canvas, sailcloth, blankets, and wooden frames, or were hauled off in carts or wheelbarrows. If casualties were not killed by missiles or metal blades, shock, exposure to the elements, loss of blood, and crude handling, their chances of acquiring gangrene were high. A surgeon could usually repair the damage from burns and flesh injuries, but could provide only limited relief to men who had been hacked, pierced, twisted, fractured, and punctured during a fight.

Astute American surgeons learned from their British colleagues about battlefield injuries. English treatises on operative surgery contained information about wounds, fractures, amputations, and current views of the pathology of inflammation. Among the many British army and naval doctors who wrote on such subjects, John Ranby, principal surgeon at the battle of Dettingen (1742), was the most quoted.⁶ As Benjamin Rush, physician general of the Middle Department in the Continental Army, remarked: "In gunshot wounds of the joints, Mr. Ranby's advice was followed with success."⁷ In 1775 John Jones of King's College published the first surgical

manual written by an American. His work was a timely compilation of material from European sources, and reflected Jones' experience during the French and Indian War.⁸ Thus, regimental surgeons had textbooks to guide them, but such information was frequently overlooked during the confusion of battle. Lack of time for individual cases, the flow of casualties, the surgeon's own stamina, and the shortages of drugs and surgical instruments presented obstacles not envisioned in medical works.

Some useful British studies on preventive medicine were also available and suggested techniques to check the high sickness rate in the ranks that typified European campaigning. During spring mobilization about 3% of the troops were usually sick; by midsummer, even without combat, 6% were often unfit for duty; and by autumn, even with a minimum of battle or movement, the rate of soldiers incapacitated by disease normally soared to 12%.⁹ To alleviate this high incidence of illness related to soldiering, Americans could rely on the work of Richard Brocklesby, who provided advice about diet, shelter, ventilation, location of hospitals, and the treatment of common ailments.¹⁰ Similarly, Donald Monro, of the famed Scottish medical dynasty, recounted his adventures during the Seven Years War with a handbook containing data related to health matters in garrisons, on shipboard, and for overseas expeditions. Noting a relationship between pestilence and the natural environment, Monro outlined the treatment for 20 diseases, listed hospital diets, and cited the drugs needed for a regimental medical chest.¹¹ The foremost writer of the day on military medicine was Sir John Pringle. His *Observations on Diseases of the Army* (1752) explained how disease nearly destroyed a British army in Germany so that combat fatalities were relatively low compared to losses from sickness. He asserted that troops benefitted from clothing changes, frequent rest periods, regular airing of quarters, and ample supplies of fresh provisions. Pringle stressed that "putrid fever" (perhaps camp typhus) invariably resulted from cramming slovenly troops into barracks, transports, and, especially, into the barns, churches, and schoolhouses normally used as hospitals.¹² Unfortunately, Pringle's common sense advice was usually ignored by the British and American military leadership during the Revolution.

Organization of American military medicine began early in 1775, when the Massachusetts Provincial Congress procured drugs and instruments for its battalions. After Lexington and Concord in April, Massachusetts used public and private buildings at Cambridge as hospitals, but no specific

medical department was then created. As volunteers from other New England colonies poured into the area, officials needed a permanent administrative structure for medical care, especially as the slaughter at Bunker Hill (June 17) demonstrated the need for centralized control of hospital affairs. While General Washington issued orders about hygienic practices, on July 21 Congress approved the Hospital Bill, which created the medical department for the Continental Army. Following the British model, Congress appointed a director-general, Dr. Benjamin Church of Boston, to direct a staff, to compile returns about the fitness of troops, and to perform commissary duties. The delegates also required that general hospitals be located behind the battle line, that flying hospitals be placed near encampments and combat sectors, and that regimental hospitals, under the direction of a surgeon and his mate, be established near the battlefield.

Unfortunately for the morale of the department, Church was soon dismissed for treason. He was replaced on October 5, 1775 by Dr. John Morgan of Philadelphia, one of the country's outstanding physicians. Morgan acquired drugs from confiscated Loyalist shops and from American privateers that docked with prizes. He screened candidates for surgeoncies in what may have been the first interprovincial medical examination, and he appealed to the public for wound dressings. The energetic Morgan recruited nurses, stewards, orderlies, and stretcher bearers, and he also instructed surgeons about wound treatment. However, little combat occurred at Boston, and the British left the harbor in March 1776 for Nova Scotia. A more insidious enemy was smallpox, which lurked in the city. With the support of Washington and the Massachusetts legislature, Morgan supervised the inoculation of hundreds of troops—a successful precedent for the future mass inoculation of the entire army.

During the investment of Boston, some regiments suffered severely from shortages of fuel, shelter, and foodstuffs, and especially from such diseases as jaundice, diarrhea, arthritis, and respiratory illnesses. It is remarkable, however, that a new army composed of units from diverse areas and crowded together under unfavorable circumstances did not have a high incidence of disease, even in the typical summer peak of gastrointestinal complaints characteristic of New England. Perhaps due to limited combat and maneuvering, the infrequency of long marches, and the generally healthy condition of these hardy provincials, the men did not succumb to pestilence. The incidence of sickness for the nine months siege averaged

12%.¹³ The medical department had functioned fairly effectively under favorable circumstances. Contagious diseases were not widespread, troops were usually adequately sheltered, many local physicians volunteered their services, the local public was overwhelmingly sympathetic to the patriot cause, and the campaign was conducted along static lines near populated supply and manufacturing centers. A significant factor, too, was General Washington's personal interest in camp sanitation, a matter demonstrated throughout the war in his general orders, which testify to his concern for his troops. But whether the department could function effectively under less fortunate circumstances would be determined soon.

The real test for the medical department came in 1776, during the Canadian campaign. Since September 1775 a two-pronged invasion of the St. Lawrence Valley had been underway. The epic march of Colonel Benedict Arnold's men through the Maine wilderness, the rapid advance of General Richard Montgomery's force from New York, and their aborted assault on Quebec in late December are familiar themes. A less known subject is the extent to which disease wrecked the patriots' chances of conquering the "Fourteenth Colony." Intent on the siege of Boston, and taking an easy victory in the north for granted, Congress failed to appreciate the difficulties in providing medical care for an army in hostile country. In December 1775 the medical staff for the Northern army was still preparing hospital installations when smallpox struck the American force. As the investment of Quebec continued in early 1776 and as fresh American troops arrived, the pestilence spread rapidly. "Great numbers of troops inoculated themselves. . . .," lamented John Henry, a Pennsylvania rifleman, "by lacerations under the finger nails by means of pins and needles, either to obtain an avoidance of duty, or to get over the disease in an easy and speedy way." Due to the lack of a quarantine policy similar to that instituted in Boston, by April one third of the troops were stricken with the loathsome pestilence. Isaac Senter, a surgeon's mate with Arnold, observed: "Scarce any of the New England troops ever had the disorder (before)."¹⁴ In early May, finding their position at Quebec untenable because of supply problems, and dislodged from their lines by newly arrived British troops under General John Burgoyne, the Americans retreated up the St. Lawrence, a mob of filthy, hungry, smallpox-ridden men. Even Montreal was evacuated in the panic. The Yankees retreated to Chambly on the Richelieu River and then to St. Jean's at the tip of Lake Champlain. By late May, even with reinforcements sent northward, only 3,000 out of 7,000 troops were fit. As the

ragged horde was incapable of combat, it was transported down Lake Champlain to safety. At Fort Ticonderoga in June the healthy prepared to defend the fortress from the redcoats led by Sir Guy Carleton, while the sick were boated further south to Fort George on Lake George.

Thus the most disastrous American campaign of the Revolution ended with casualties estimated at 40%. The experience demonstrated that capable medical personnel supervised by vigorous military leaders were necessary to protect the rank and file, and that more than the bullets and bayonets of the enemy, smallpox, the "King of Terrors," had wrecked the invasion. In three months more than 5,000 Americans were killed, captured, or rendered unfit for service, and Canada was irretrievably lost to the American cause.¹⁵

While the British assembled a fleet at St. Jean's that summer, the medical staff at Fort George toiled to heal their charges. Due to logistic problems, medical stores were virtually unobtainable. In the emergency, women attached to Pennsylvania regiments were drafted as nurses, and hemlock branches were used as mattresses for the sick. Communities in upper New York and the Hampshire Grants contributed rags, linen, and herbs. Some Jesuit bark (used for a variety of fevers, not only for malaria) arrived in September, and an apothecary shop functioned at the stockade by early autumn. About 1,500 men were admitted to little Fort George in July; by October some 3,000 patients were treated here, the largest military hospital of the entire war.¹⁶

At Ticonderoga, General Horatio Gates enforced sanitary standards, quarantined men with smallpox, ordered reports on the morale of his regiments, and had his surgeons propose measures to improve the health of the garrison. Further south, recruits marching to the Lakes—potential carriers of smallpox—were carefully screened. Medical men inoculated the newcomers on their way to Skenesboro (the main depot for Lake George), established quarantined campsites, forbade self-inoculation, and required that soldiers present certificates which attested to having been officially inoculated.¹⁷ Considering the shortage of staff, the number of routes through the Green Mountains, and the vast area to be policed, these preventive measures were generally effective. As a result of such precautions and the flow of drugs, tents, and provisions to Ticonderoga, the health of the troops at the bastion improved. Claiming that smallpox had been eradicated at his post, in late September Gates informed Washington that the citadel could be defended.¹⁸ Due to Carleton's delay in invading New

York that summer, the valiant American naval action off Valcour Island in October, and the lateness of the campaign season, the British withdrew from the fortress in November. Until 1777 at least, Ticonderoga was safe. The medical department had played a vital role in checking disease that could have severely impaired the defense of America's "Gibraltar of the North."

Meanwhile, during the summer of 1776, George Washington prepared to defend Manhattan. Although Morgan's staff tried to guard the soldiers' well-being, the physical condition of regiments was affected by environmental factors caused in part by transformation of an 18th century metropolis into a major military base. The heat of the torrid summer, the enervating toil of constructing fortresses, the prevalence of venereal disease, the polluted water supply, and the primitive sanitary habits of the troops were detrimental to the army's health. As reinforcements inundated New York during July and August, the city's sanitary services collapsed, and water sources became contaminated. By late August, when rain finally fell, the drought, the lack of fresh water, and a host of debilitating diseases (scabies, diarrhea, dysentery, typhoid, syphilis) had weakened Washington's army even before enemy warships appeared on the horizon.¹⁹ On August 7, before action commenced, 6,500 out of 17,000 patriot troops were listed as "sick present" or "sick absent." At Harlem Heights in September, where Washington rallied his men after being driven from Long Island and Manhattan, he had 20,000 "on paper," of whom 7,000 were listed as unfit, and by early October at White Plains the number increased to 8,000.²⁰ Clearly, disease, as at Ticonderoga, diminished the army's efficiency and contributed to the plummeting morale of the troops.

During the retreat from Manhattan, Morgan's medical organization disintegrated because, as regiments scattered, he lost control of his staff. Some surgeons deserted their units; the terrified militia seized hospital wagons for themselves; and some untreated casualties actually bled to death without receiving any treatment. In the confusion Morgan managed to find sanctuary for 1,000 patients at Hoboken and Weehawken, and, then, after the fall of Forts Lee and Mifflin in late November, Morgan had to remove his charges to Newark and Hackensack. The stream of sick and wounded continued, and again Morgan had to disperse his patients to safer locations in New Jersey, to Fishkill and Peekskill on the Hudson, and to Connecticut, where 2,000 convalescents from White Plains were sheltered in Norwich and Stamford.²¹

As Washington retreated through New Jersey in November, the medical department was blamed for the shocking treatment of casualties. Generals, politicians, and civilian physicians complained about the chronic shortages of drugs, personnel, and facilities. Under these circumstances, Morgan was inevitably denounced for the chaos, and reforms of the department were inevitable. In fact, even before Washington's winter victories at Trenton and Princeton, Congress considered revamping the maligned department. In September the delegates had already trimmed Morgan's authority, and in December ordered Dr. William Shippen, Jr., Morgan's rival for prestige at the College of Philadelphia, to prepare convalescent centers in Pennsylvania.

By early December wagon loads of sick reached Philadelphia where the Pennsylvania Council of Safety found haven for a thousand casualties. Another thousand men were scattered to Easton, Bethlehem, Allentown, and Wilmington. Wrecked by controversy and blamed for virtually every defect related to the care of the rank and file actually caused by the breakdown of supply and commissary services, the medical department barely functioned as it was designed by Morgan. As the inevitable scapegoat, he was curtly dismissed by Congress in January 1777.

Combat casualties in the New York-New Jersey campaign were about 1,200 men. How many troops died from disease is conjectural, but one estimate is several thousand.²² During the last three months of the year, one third of Washington's force was incapable of active duty. Obviously, the army could not again sustain such losses, or it would disintegrate as a fighting force.

Early in 1777 at Morristown, Washington pondered improvements in the department. After consultation with Shippen, he submitted a plan for reorganization to Congress. As a result, Shippen was appointed director-general, four regional departments were created, which extended Shippen's authority to the Virginia-North Carolina boundary, and medical men received higher pay in an effort to attract a higher caliber of professionals to the service. Shippen informed the public by newspaper advertisements that Congress desired "men of the first abilities in the field, to watch over the health and preserve the life of the soldier. . . . Under these [circumstances] none but gentlemen of the best education, and well qualified, are employed as senior physicians, surgeons, etc. All the military hospitals of the United States," he assured a dubious citizenry, "are in excellent order, and the army enjoy a degree of health, seldom to be seen or read of."²³

Related to these changes was the publication by Benjamin Rush in the *Pennsylvania Packet* of the first printed sanitary code for the army.²⁴ His advice was reprinted in many colonial newspapers and may have popularized concepts of hygiene promulgated in regimental orders year after year to remind careless officers and men. The most significant medical advance in early 1777 for the army was the inoculation of troops for the summer campaign. If levies could be inoculated efficiently, Washington believed, smallpox could be checked, regiments would have the necessary time to recuperate from the treatment, and recruiting would be encouraged. From February until May, Shippen's staff inoculated men at major depots—Albany, Baltimore, Boston, Fishkill, Germantown, Hanover (Hampshire Grants), Morristown, Philadelphia, Providence, and at Dumfries, Colchester, and Alexandria in Virginia. Though troops who joined the army in future years also had to be inoculated, the program of 1777 was a success. The adoption of mass inoculation eliminated a major obstacle to faltering enlistments, and in the spring thousands of men converged on the Delaware and other mobilization centers to join Washington's relatively smallpox-free army. While death by the natural smallpox infection averaged 16%, the mortality rate for troops who underwent supervised inoculation averaged less than 1%.²⁵ No physician in the nation had the prestige or authority to convince his countrymen of the necessity for this precaution. More than any other contemporary figure, Washington deserves credit for advocating the treatment, and for making the single greatest contribution to preventive medicine during the war.

The reformed medical department contributed to victory in 1777 at Saratoga. Although Burgoyne's force drove the patriots out of Ticonderoga in July, descended Lake George with ease to Skenesboro, and pushed through the forests to the Hudson by early September, the British army was checked at Bemis Heights and at Freeman's Farm by October. Granted that surgery was practiced here under the usual frightful conditions, the battles of Saratoga are significant in medical history for two reasons. First, casualty evacuation, judging by the apparent lack of recorded complaints, was reasonably effective—if one can conceive of carting the wounded along rutted roads in open wagons for five to seven agonizing days as efficient. About 500 American, British, and Hessian casualties were conveyed to Albany and Schenectady, where they were treated by their own surgeons.²⁶

Second, the Saratoga campaign was a medical success due to several factors—vigorous attention to camp sanitation, an ample supply of drugs, the

availability of sufficient hospitals from Lake George to Albany, and the adequacy of medical personnel. The relatively low level of sickness that prevailed during the late summer and autumn may be explained by the infrequency of typhus, the constant change of camp sites, and the generally favorable weather. From March 1 to December 16, 1777 only 250 men died in New York army hospitals, a figure lower than in any other northern campaign, with the exception of the siege of Boston.²⁷ Generals and politicians, for once in the war, praised the medical staff for their accomplishments. Gates, in fact, requested Congress to bestow "some Honorary mark of favor" on the medical staff of the Northern Department. As a result, on November 6 the delegates formally lauded the army doctors for their achievements at Saratoga, the only such testimonial to the medical profession during the entire war.²⁸

But 1777 was a disaster for Washington's troops in Pennsylvania, who were unable to ward off the British invasion from Chesapeake Bay. Hospital arrangements for Brandywine (September 11), Germantown (October 4), and for the defense of the Delaware fortresses in November were inept. Before the British marched triumphantly on to Philadelphia following Brandywine, casualties were hastily removed from the city and scattered to rural villages. The state was confronted by masses of helpless sick and wounded men, and lacked facilities to house them. Hence, the military commandeered buildings in such religious communes as Bethlehem (for the second time in the war), Lititz, Ephrata, and Quaker meetinghouses. Supply arrangements for these locations were inadequate, and typhus and dysentery caused havoc among the ranks. The medical department was again castigated for the high incidence of morbidity. Rush, who blamed Shippen, had the most sarcastic comments about the crisis. Advising General Nathanael Green about defeating the enemy with pestilence, Rush asserted: "A sure and certain method of destroying [General] Howe's army without powder. . . [would be to] lead them through any of the villages of Lancaster county where we have hospitals, and I will ensure you that in 6 weeks there will not be many of them alive or fit for duty."²⁹ To these criticisms, Shippen—who had received little assistance from the disintegrating quartermaster and commissary departments—acknowledged that the sick suffered needlessly. The troubles arose, he claimed, because the troops were unaccustomed to campaign hardships, they had retreated continually, they lacked clothing and blankets, and that "the sick were moved great distances in open wagons"³⁰ Under a torrent of invective

tive for his supposedly careless and dishonest supervision of hospitals, Shippen would be subject to a congressional investigation. When the Continentals trudged off to Valley Forge in late December, again, one third of Washington's army was listed as unfit for service.³¹

As a result of the sorry Pennsylvania campaign, the medical department was again reformed. Accused of profiteering from the sale of wine and drugs, Shippen was divested of his commissary duties. The department was decentralized, and a purveyor-general—as in the British army—was named to procure straw, bedding, and provisions for the hospitals. At Washington's insistence, brigade commanders at Valley Forge enforced hygienic standards at the encampment, and frequently visited outlying hospitals. Better records of patients were maintained, the medical staff combatted the "itch" common to troops confined for months without adequate washing and bathing facilities, and the inoculation of recruits continued through the spring.³² There were two major developments in military medicine that bleak year. Under Washington's urging, Congress authorized the construction of a permanent army hospital at Yellow Springs, 10 miles from Valley Forge, where 1,300 men were treated.³³ Secondly, army apothecaries manufactured some drugs at Carlisle and Yellow Springs, and standardized medicines for regimental chests. Further, Dr. William Brown, Physician General of the Middle Department, published the *Lititz Pharmacopoeia*. This booklet, printed in Latin, advised surgeons on the simplest, cheapest, and most available drugs, particularly botanicals indigenous to the area.³⁴ The gradual amelioration of hospital services—to which Baron von Steuben contributed his part with advice to officers about the necessity of cleanliness in the ranks—was part of the general reorganization of the army at Valley Forge. By the late spring of 1778 the medical department functioned efficiently, medical chests were filled, hundreds of men were inoculated, the transfer of convalescents proceeded capably, and regiments from nine states presumably learned the rudiments of hygiene.

Yet, the aftermath of the battle of Monmouth (June 23), after the British evacuated Philadelphia for New York, revealed the same shocking handling of casualties that typified 18th century warfare. Dr. William Read of Georgia, for example, remarked that he treated 20 wounded men for four days without assistance.³⁵ Nevertheless, after the British left the Delaware for the Hudson and as combat tapered off for the year, the army remained healthy. The percent of sickness declined from 21 in July to 16 in

December, figures far lower than for the same months in preceeding years.³⁶

During the winter of 1778-1779 the troops were quartered mainly at Middlebrook and other New Jersey locations, while other contingents were positioned in a broad arc to cover Manhattan. The winter was fairly mild, the army was suitably housed, and supply services were reasonably efficient. Hence, the intense suffering that characterized Valley Forge was not repeated. Due to a moderate season, strict supervision of hut construction, and rigid enforcement of sanitary standards, the incidence of sickness at Middlebrook was relatively low—the sickness rate of 15% in January 1779 declined to 9% by May 1780, the lowest incidence of illness since the war began. Compared to the 2,000 men who perished at Valley Forge, only 100 died at Middlebrook.³⁷ For the rest of the year, little fighting occurred in the middle states as the war became stalemated in the north.

For winter quarters in 1778-1780, Washington selected Morristown. Due to the severity of storms, insufficient congressional appropriations, inefficient commissary services, and roads made impassable by blizzards for weeks, the troops were in misery. Bandages were so scarce that old tent cloth was used to cover festering wounds. As the fierce storms abated in late January 1780 and food reached the encampment, sanitary rules presumably relaxed during the brutal weather were again enforced, inspection of huts occurred regularly, and bedding was frequently aired. Though the Morristown winter was severe, the illness rate was remarkably low—only 11% in January 1780 and 10% in May. Only eight men died at the site by June.³⁸ Perhaps the ranks, composed mainly of veterans, were better able to fend for themselves; possibly the medical staff, such as Dr. James Tilton of Delaware, may have learned something about preventive medicine. Even the use of a novel type of hospital, the “Tilton Hut”—a fairly spacious, amply ventilated log building with separate wards fumigated by smoke curling above the patients’ heads to provide a partial disinfectant—may have contributed to the reduction of morbidity.³⁹ The use of the Tilton Hut at Morristown (which apparently was not duplicated elsewhere during the war) was the only modest improvement in medical services that year. Shippen, against whom Morgan and Rush had been accumulating evidence for years, was placed under court martial for improper conduct and for speculation in hospital stores.

As a result of Shippen’s trial (January 15 to August 10, 1780, with appropriate recesses), and suspicions that other ranking medical officers were

misappropriating public funds, Congress was stingy with money for the department. The Medical Committee ignored repeated requests from the purveyor for funds, indicating thereby a lingering distrust of departmental finances. Further, the morale of the medical personnel continued to erode. Testimony for and against Shippen had forced staff members to take sides in the sordid investigation. Medical men were offended not only by a two years' delay in receiving their back pay, but also because Congress hesitated to grant them the same pension and land bounty privileges that it provided line officers. Congress also questioned administrative practices at some hospitals. At Philadelphia, Shippen maintained excessive personnel for a handful of patients; Dr. John Warren refused to close his hospital in Boston, nor would he accept reassignment; Dr. Philip Turner, purveyor for the Eastern District (New England), lobbied for a hospital to be built in New London, from which, it was assumed, he would materially profit. Isaac Foster, the district director in New England, stockpiled medicine and stores for his own use. Washington had to send an armed guard there to recover the material. As a consequence of such scandals, Congress was so disenchanted with the medical men that it invariably scrutinized their budget requests with excessive zeal. As Dr. Barnabas Binney expressed it: "The dirtiest and basest actions are everyday depreciating the profession... 'till the very appellation (of doctor) had become the butt of satire, ridicule, and contempt."⁴⁰ Shippen was acquitted of the charges by the court and by Congress. But, under a cloud of censure, he lost the confidence of authorities and resigned his post in January 1781. Shippen and Morgan, leaders of the medical profession, still continued their feud with pamphlets and letters for the elucidation of the public. But neither recovered the vigor, brilliance, or imagination of their prewar years, and their careers were nearly destroyed in this disgraceful episode that demeaned the medical profession.

The battered department was yet again reorganized in September 1780, and on January 17, 1781 Dr. John Cochran was appointed director-general, with authority to eliminate wasteful departmental hierarchies. Cochran, the only successful American director-general of the war, tried to invigorate the demoralized bureaucracy. He managed to convince a tight-fisted Congress beset by enormous financial difficulties to grant his men back pay and equitable pension benefits; he placated disgruntled subordinates, and managed to persuade some embittered physicians to remain in the service.⁴¹ He assigned Dr. James Craik—one of Washington's favorites

and a fellow Virginian—to the task of preparing medical facilities for the French expedition under Comte de Rochambeau at Providence. Even though Congress was impressed by Cochran's administrative talents, his department was subjected to the economizing policies of Robert Morris, superintendent of finance. By the summer of 1781, even though some drugs and equipment were landed from French ships, Cochran's staff was still almost destitute of medicine. It was at this low state of affairs for the department that the scene of the war shifted dramatically to the south, where Charles, Earl Cornwallis, was conquering the Carolinas.

Since the inception of the war, the southern colonies had retained control of hospital facilities for troops within their boundaries. Even though the administrative authority of the medical department of the Continental army extended to North Carolina, Dr. William Rickman, appointed director of the hospitals by the Virginia Assembly in 1776, successfully deflected Shippen's attempts to supervise inoculation procedures in Virginia during the spring of 1777.⁴² Virginia even built its own military hospital—the Vineyard Hospital near Williamsburg—the only such state-constructed building of the war. From South Carolina, Dr. David Olyphant, the state's director-general, pointed out to Congress that his province's medical men were quite capable of supervising their own military hospitals, and, further, that southern physicians were better qualified to treat the rank and file because of unique environmental features of the area.⁴³ For the early war years, fighting in the south was generally limited to repelling coastal raids by the Royal Navy, defending the frontier from Indian attacks, and quelling bands of Loyalist irregulars. As a consequence, medical arrangements were handled by local authorities in each province; little inter-provincial cooperation among the southern states occurred in such matters, and, apparently, medical staff from the north was not stationed at southern hospitals.

The tempo of fighting in the south changed in December 1778, when the British captured Savannah and in March 1779, when the Americans suffered 400 casualties at Briar Creek. As the redcoats pacified Georgia and advanced up the South Carolina shore, General Benjamin Lincoln of Massachusetts assumed command of the southern army in Charleston. South Carolina had its own medical establishment led by such prominent physicians as Olyphant, Peter Fayssoux, and David Ramsay, and their assistants were all southerners.⁴⁴ When the British captured Charleston in May 1780, virtually the entire Continental army in the south and many

supporting militia units were lost—the greatest defeat of the Revolution. Inasmuch as a majority of the south's medical staff was imprisoned on vessels in Charleston harbor, a new cadre of doctors had to be organized for the new Continental army forming in Virginia.

Hence, in June, when Gates arrived in Virginia to revitalize the force, he was without a medical staff, drugs, or equipment; even Virginia and North Carolina were unable to assist him with supplies or personnel. Not until July 1780, in fact, did Congress appoint physicians and surgeons to his command. Dr. James Brown of Virginia, the chief physician and surgeon of Gates' southern army, reported from Richmond that he was completely destitute of equipment; General Otho Holland Williams, one of Gates' key commanders, complained bitterly from Salisbury about wretched hospital conditions for his Maryland troops.⁴⁵ After Gates was severely defeated at Camden on August 16, the medical department in the Carolinas was again in disarray. After the battle of Camden, Dr. Hugh Williamson of North Carolina remarked that his small medical team labored for weeks to heal 250 casualties who suffered 700 wounds. "The Enemy was disposed to neglect us, and a [British] victory. . . did not increase their humanity. For eight or ten days after the Battle our people suffered great neglect. . . . Our militia surgeons disappeared. . . and Cornwallis ignored us."⁴⁶ Thus, for the second time in a year, medical arrangements for the south had disintegrated.

When Greene, replacing Gates, arrived in Charlotte in December 2, 1780 to reconstruct the shattered southern command, he was stunned at the shocking state of hospitals for his tattered units. He apologized to Francis Marion, who pleaded for a surgeon, stating that he had no information about medical arrangements. Greene complained to the Board of War about "the deranged state of the hospitals. . . .," and to Congress he lamented that army medical affairs in the Carolinas were "shocking to humanity." Hard pressed for the barest equipment, Greene even beseeched a Moravian community to make him four sets of surgical instruments.⁴⁷ Inasmuch as most of the southern army doctors captured at Charleston and at Camden were still incarcerated, Greene had to acquire his own medical staff. Due to Greene's pleas and presumably to Washington's insistence, Congress on March 22, 1781 finally incorporated all the southern states into the jurisdiction of the medical department. Cochran sent Greene some experienced northern medical men, and during the summer Fayssoux, Olyphant, and other Carolina doctors were exchanged for their British

counterparts. As his medical staff expanded, Greene required that the southerners comply with regulations used in the north calling for regular sick returns, inventories of stores, and reports on hospital conditions.⁴⁸ Thus, due to the crisis in the south, the southern medical men were formally integrated into the Continental medical department. How Greene managed to acquire provisions and medical supplies from Virginia, where Loyalist and British raiding parties repeatedly struck American depots, or from the few ports on the southern coast open to American vessels, or from isolated communities in the back country remains a puzzle. After Greene fought a mauling battle with Cornwallis at Guilford Court House (March 16), he marched south to wage partisan warfare in the Carolinas and Georgia against isolated enemy outposts. Practically isolated during his campaigning there, Greene relied heavily upon local resources, for little evidence is available about assistance in medical matters to his army from the north.⁴⁹

Meanwhile, as Greene conducted semiguerrilla warfare in the Carolinas, Washington and Rochambeau, far better equipped than Greene due to a generous supply of French gold, marched south in July to trap Cornwallis at Yorktown. Allied casualties at the siege were relatively low—250 French and 90 Americans—but sickness rates due to malaria, perhaps typhoid, and the “ground itch” (probably hookworm) were high. As Washington hurried back to the Hudson in November after the British surrender in Virginia, some 1,500 Allied troops remained behind to recuperate. As James Thacher, a Massachusetts surgeon at Yorktown, remarked: “Our New England troops had been very sickly, the prevailing diseases are remitting fevers, which are very prevalent in this climate during the autumnal months.”⁵⁰ American casualties were housed in the Vineyard Hospital and the French in the Governor’s Palace in Williamsburg and at the College of William and Mary. Sadly enough, the medical staff attending these unfortunates voiced the same complaints in late 1781 about the chronic neglect of patients—shortages of drugs, fuel, blankets, clothing—that had been mentioned in 1776. Due to numerous factors far beyond the control of the medical men, the medical department at the victory of Yorktown appeared as ineffective in healing the sick as it had been at Manhattan in 1776.

What, therefore, can be summarized about the impact of the American Revolution on the medical profession in the new republic? The Revolution was a long and bloody struggle. The 1,331 military engagements and 215

naval actions of the war took a heavy toll of human life. About 25,000 died in the struggle—6,800 in battle, 8,500 in British prisons, and 10,000 in camps or hospitals. The mortality rate of soldiers and sailors was 0.9% of the population, second only in the major wars of the United States to the mortality rate of 1.6% during the Civil War. Considering that 200,000 men were under arms during the conflict, the rate of mortality of American participants in the Revolution was 12%, a figure close to the 13% suffered by Union forces against the Confederacy.⁵¹ The sickness rate was likewise high. The highest incidences of illness for Washington's army, excluding southern campaigns and minor actions, reached 35% in December 1776 and 35.5% in February 1777. The lowest level of sickness for one month in 1775 was 10.5%, for 1777 9.6%, for 1778 17.7%, for 1778 16%, for 1779 8.7%, for 1780 8.2%, and for 1781 5.4%. The rate of troops incapacitated by sickness for the eight year war averaged 18%.⁵² Clearly, the war took a heavy toll of lives, and diseases so frequently crippled the American army that it was rendered relatively inactive for months.

The administration of the hospitals had a direct influence on the efficiency of the Continental army. The medical department was not prepared for large scale warfare in 1776, and, due to the pressure exerted by yearly campaigns, it was not until mid-1778 that some stability appeared in its departmental structure. Suspicious of excessive centralization by medical chiefs, and inexperienced with hospital arrangements, Congress was unable to decide until late 1780 how to supervise the department. Only in 1777 were Congressional appropriations considered adequate for the hospitals. Except for the 1776 retreat to the Delaware, and the 1778 year at Valley Forge, delegates confronted with a host of other problems seemed indifferent to hospital conditions unless they were deluged with chronic complaints, as in Shippen's case. The composition of the Medical Committee, one of the least important of 33 Congressional committees, frequently changed its membership, and seldom were civilian physicians represented. The effectiveness of the department was plagued not only by politics—for delegates tried to place constituents with medical training in high appointments—but also by constant disputes between directors and their regional subordinates, between staff physicians and regimental surgeons, and between doctors and generals. The chronic shortages of drugs, supplies, and instruments further contributed to the harassed state of the department.

With the exception of the building constructed by Congressional order at Yellow Springs and that at Williamsburg by Virginia, army hospitals were

usually converted shelters, poorly suited for the reception of patients. But such facilities were typical of those for European armies in the 18th century. Evacuation procedures for casualties seem crude, but improvements in transporting the wounded humanely and efficiently did not occur until the French revolution, when Dominique-Jean Larrey in 1793 experimented with specially constructed ambulance wagons and with trained medical corpsmen. One can further appreciate the limitations of military medicine during the Revolutionary War by realizing that the American army did not have a medical corps, and that the regulations that constituted an embryonic program of preventive medicine emanated not from physicians, who could only give advice when asked, but from military orders of the day and orderly books. Although precise comparisons of medical care for major European armies are difficult to ascertain, it appears that the level of medicine in the Continental army was roughly equivalent to that of Great Britain.⁵³

Did the Revolution influence the development of medicine in America? One result of the war was to demonstrate the importance of hospitals. Whereas only one permanent hospital (in Philadelphia) existed in North America in 1775, many buildings were used during the war as army hospitals. Although Washington was scrupulous in requesting the support of provincial officials and church leaders in acquiring shelter for his men, Governor Thomas Jefferson of Virginia, for example, and various brigade commanders were less concerned with the protests of outraged citizenry about what they considered violations of property rights. Ample documents in the papers of the Continental Congress demonstrate that owners of chapels, schoolhouses, meetinghouses, and private homes that had been seized by officers as temporary hospitals were indignant that their buildings were being destroyed by a careless soldiery or that a plague would contaminate the community. Whereas enough evidence indicates that appeals by directors-general to the public for medicine, bedding, and wound dressings brought favorable responses, it appears that some localities were reluctant to house sick soldiers. Morgan encountered great difficulty in finding haven for his patients in Newark; the trustees of an academy in Fishkill complained about soldier-patients damaging their school. In 1776 the Committee of Safety of Virginia was unable to receive permission to use the William and Mary campus, and in 1779 medical officers encountered similar problems at the College of Philadelphia. Yet, in protecting the health of its soldiers and sailors, the state assumed a responsibility in public

health matters for servicemen that eventually had far-reaching consequences, even though the federal government did not construct naval hospitals until the 1820s.

Due to the large numbers of patients, hundreds of physicians in the services had opportunities to observe diseases on an unprecedented scale. Army doctors discovered that pestilences common to armies could be curtailed by controlling certain causative factors related to the soldiers' well-being. Although physicians were unable to stem communicable diseases, they developed sanitary codes for generals to enforce, collected data about pestilence, and acquired experience in protecting large groups of men from contagion. The war provided the medical men with a broad, practical education in treating smallpox, typhus, dysentery, malaria, and influenza. Yet, with the exception of the great victory of mass inoculation over smallpox, little changed in preventive medicine for decades. As the physicians and surgeons returned home after demobilization, they used the same treatment—the lancet, the emphasis on purging the body, the polypharmacy—that had characterized their practice for centuries. Physicians still grasped at metaphysical theories; the scientific facts about disease did not emerge until the next century.

Surgery remained at a low ebb during the war, and apparently no new techniques in operative procedures appeared. Still, army doctors witnessed a great variety of operations and had innumerable opportunities for dissections. With ample human material available, surgeons undoubtedly enlarged their skills and their anatomical knowledge. John Warren, who performed the first recorded successful operation of the shoulder joint in America on a soldier in 1781, remarked that “the military hospitals of the United States furnished a large field for observation and experiment in the various branches of the healing art. . . .”⁵⁴ James Tilton commented that “Amputation and cutting became less fashionable. From obstinacy in the patients, we had the opportunity of observing that the limbs might be saved, which the best authorities directed to be cut off. I have seen gunshot wounds through the elbow, knee, or ankle saved without the loss of a limb. It therefore became an axiom with us to take the chance of saving the limb in such cases.”⁵⁵ Yet little evidence exists to indicate that significant developments in wound treatment occurred until John Hunter of England completed his classic treatise on *Blood, Inflammation, and Gunshot Wounds* (1794), and until surgeons had opportunities to experiment during the Napoleonic Wars. One unique incident about wound treatment did

come out of the Revolution. Doctor Charles Gilman of New Jersey accidentally discovered the disinfectant properties of alcohol. Wounded in 1776 at Harlem Heights, Gilman remarked that the injury to his hand was painful, and that it continually discharged pus. Soon after, he remembered, "I spilled—quite accidentally—for I drunk too much rum—some rum upon the member. I covered it, and in two days, I noticed no odor, I removed the bandage, and the wound was healing." Thereafter, Gilman claimed, "all wounds were soaked in rum clothes before covering."⁵⁶ But information about Gilman's practice and his influence is sparse, and, apparently, no other record of this discovery survives from the Revolution.

In pharmacy, the Revolution stimulated the domestic production of drugs and specialization by the apothecary. Some drugs (possibly nitre, cream of tartar, castor oil, oil of turpentine) were manufactured at army laboratories in Pennsylvania in 1778, but not until 1786 did the first large-scale production of such compounds as Glaubers' salts and muriate of ammonia begin in Philadelphia, packaged by the same firm, Charles and Christopher Marshall, that had supplied the Pennsylvania and New Jersey line in 1776. The emphasis on drug standards and the knowledge required to compound chemicals demonstrated the importance of the 25 apothecaries who served in the war. A gradual professional distinction appeared in the postwar era between physicians and pharmacists, as the physicians—usually preoccupied with patients and with mastering the burgeoning materia medica of the day—turned the task of preparing remedies over to the apothecary. The symbol of this occupational specialization was the written prescription for a drug, a device known since the early 18th century in America, a practice in use at the Pennsylvania Hospital since the 1760s, and one continued through the war. Henceforth, apothecaries had an expanded role in dispensing medicine. After the publication of the army's *Lititz Pharmacopoeia* came the impetus to improve drug standards on a national level, demonstrated by the publication of the *Massachusetts Medical Society Pharmacopoeia* (1808), the *New York Hospital Pharmacopoeia* (1812), and the first *National Pharmacopoeia* (1817-1819).

In the intellectual realm some changes are apparent. Scientific activity probably declined during the war, the personal and institutional links that American physicians had with Britain and the Continent were temporarily severed, and the normal flow of books and periodicals across the ocean was interrupted by the conflict. Professional clubs and societies on the seaboard were practically dormant, King's College was closed, and the medical

school at the College of Philadelphia had a sharp drop in enrollment. The contacts with British, German, and French surgeons may have disseminated professional techniques from Europe, but except for Thacher's commentary about his European medical colleagues at Albany (he admired the British doctors, but he considered the Hessians incredibly crude), additional information on this point is lacking. Jean François Coste, chief physician of the French expeditionary force under Rochambeau, spoke to groups of American doctors, discussed his experiments in treating venereal disease, and wrote a pharmacopoeia for military use while in America. But, in general, the influence of physicians attached to the European forces is not apparent. More significant in the exchange of ideas for the profession was the very gradual erosion of provincialism in American medicine. Surgeons from isolated communities in 13 states assembled in a great national endeavor to fight epidemic disease and to learn the rudiments of hygiene. Dr. Samuel Adams of Massachusetts noted to his wife that duty at desolate Ticonderoga in 1776 was particularly beneficial for him. "I do not repent having come to this part of the world for especially it has been a good opportunity in my profession, particularly in the branch of surgery."⁵⁷ The physicians exchanged ideas, discussed the merits of various therapies, traded medicines and formulas, and presumably they commented about unique surgical experiences. The war was a nationalizing factor for the medical profession.

Further, six army doctors published accounts of their observations. Jones wrote the first book on surgery (1775), and Morgan wrote a new Boston edition in 1776 of Baron Dimsdale's treatise on inoculation. Rush's essay on hygiene appeared in 1777 and Brown's work on pharmacology in 1778. Rush commented on smallpox, typhus, and other aspects of preventive medicine in his *Medical Inquiries and Observations* (1794), a work republished during the War of 1812 and still considered useful during the Civil War. The most significant commentary on military medicine of the era was written by Tilton, whose *Economical Observations on Military Hospitals* appeared in 1813. An advocate of sanitary standards and a unified medical corps, Tilton became director-general of the Army Medical Department during the War of 1812. Soon after the Revolution, Ebenezer Beardsley of New York wrote about dysentery, Barnabas Binney of Rhode Island about gunshot wounds, and Hugh McCall of Georgia about cancer. Though these works did not match the more famous studies in British military and naval medicine by Pringle, Hunter, and James Lind, these

contributions represent an important step in the emergence of an American medical literature.

The war may have been an impetus to the improvement of the medical profession. Only a small number of army doctors in 1775 had college degrees, but it was this select minority who won the high appointments in the department. Due to the need to weed out unqualified candidates for surgeoncies, several northern states established examining boards for applicants. Evidence about the relative success of the university-bred candidates in passing the tests compared to unlettered apprentices is scant, but probably the better educated surpassed their competitors. As Thacher said of his examination in 1775 at Boston by Morgan: "Six of our number (16) were privately rejected as being unqualified."⁵⁸ At Ticonderoga in 1777 Colonel Samuel Brewer of Vermont notified Dr. Jonathan Potts of Philadelphia, the deputy director general, that he had appointed Dr. Thomas Binney as his regimental surgeon. Apparently Binney was about to be examined by Potts, for the Colonel wrote: "How far he will be able to answer your scholastic question, I can't say, but can only say that I know he has had long and sufficient country practice at home, and has been on two or three campaigns in the army, and has given very good satisfaction."⁵⁹

Probably as a result of war, several states by 1783 enacted legislation to control quackery, and by 1800 15 states had laws to regulate the admission of new physicians to practice. Another effort of the war was to end the traditional colonial dependence on Edinburgh for advanced medical training and to increase the number of medical graduates from King's and the College of Philadelphia. Medical societies reappeared. In 1781 the Massachusetts Medical Society was organized by 14 Boston physicians, some of whom had served in the war; by 1791 six more medical groups were formed to advanced medical knowledge. In 1797 the first American medical journal, *The Medical Repository*, was published in New York, followed by several medical publications in Philadelphia; and in 1812 the *New England Journal of Medicine and Surgery* appeared.

In summary, it appears that the War of American Independence had a definite but not a decisive impact upon the practice of medicine in America. The states assumed some responsibility for public health matters, some minor improvements occurred in wound surgery, the domestic production of drugs was stimulated, and several physicians published accounts of their wartime experiences. Yet, scores of doctors served on Committees of Correspondence on the county and provincial level, and many helped to pro-

vide the groundswell of support to the Revolutionary movement. Twenty-one physicians were members of the First Provincial Congress of Massachusetts, five physicians signed the Declaration of Independence, six delegates with medical training sat in the Continental Congress, and 1,400 medical men volunteered for the army or navy. Clearly, the physicians and surgeons played an important role in the struggle, and the War of American Independence may have hastened the professionalization of American medicine.

NOTES AND REFERENCES

1. The standard works are Toner, M.: *Medical Men of the Revolution*. Philadelphia, Collins, 1876; Duncan, L. C.: *Medical Men in the American Revolution, 1775-1783*. Carlisle, Pa., Medical Field Service, 1931; Gibson, E.: *Dr. Bodo Otto and the Medical Background of the American Revolution*. Springfield, Ill., Thomas, 1937; and Applegate, H.L.: The American revolutionary war hospital department. *Milit. Med.* 126:296-306, 1961.
2. Although American army campaigns under General John Sullivan at Newport, R.I. (1778) and into the Iroquois country of western New York (1779) were major undertakings, limited documentation related to medical affairs is available.
3. Jones, G.W.: Medicine in Virginia in revolutionary times. *J. Hist. Med.* 31:250-70, 1976.
4. Cartwright, F.F.: *The Development of Modern Surgery*. New York, Crowell, 1968, p. 13. See also Wangenstein, O.H. and Wangenstein, S.D.: *The Rise of Surgery. From Empiric Craft to Scientific Discipline*. Minneapolis, University of Minnesota Press, 1978, who state that "...it is difficult to find statistical reports of amputation before the fourth decade of the nineteenth century," pp. 48-49.
5. Cash, P.: *Medical Men at the Siege of Boston, April 1775-April 1776*. Philadelphia, American Philosophical Society, 1973, *passim*.
6. Ranby, J.: *Method of Treating Gun-shot Wounds*. London, Lowndes, 1781, 3rd ed.
7. Rush, B.: *Medical Inquiries and Observations*. 2 vols. Philadelphia, Johnson and Warner, 1815, 4th ed., p. 260.
8. Jones, J.: *Plain Concise Practical Remarks on the Treatment of Wounds and Fractures*. New York, Bell, 1775. For a summary of surgical knowledge in this era, see Ravitch, M.M.: Surgery in 1776. *Ann. Surg.* 186:291-300, 1977.
9. Hennen, J.: *Principles of Military Surgery*. Edinburgh, Constable, 1820, 2nd ed., p. 30.
10. Brocklesby, R.: *Oeconomical and Medical Observations in Two Parts, from the Year 1758 to the Year 1764 Inclusive. Tending to the Improvement of Military Hospitals and the Cure of Camp Diseases Incident to Soldiers*. London, Beckel and de-Handt, 1764.
11. Monro, D.: *An Account of the Diseases Which Were Most Frequent in the British Military Hospitals in Germany*. London, Millar, 1764.
12. Pringle, J.: *Observations on Diseases of the Army in Camp and Garrison in Three Parts*. London, Millar, 1752.
13. Cash, op. cit., p. 105. See also Estes, J.: Medical letters from the siege of Boston. *J. Hist. Med.* 31:271-91, 1976, and Medical Problems at the Siege of Boston. In: *Bicentennial Programs*. 1976. Evansville, Ind., St.

- Mary's Hospital, 1776, pp. 14-37.
14. Roberts, K., editor: *March to Quebec*. New York, Doubleday, Doran and Co., 1938, pp. 238, 274.
 15. Casualty rates are cited in Jones, C. H.: *The Campaign for the Conquest of Canada*. Philadelphia, Porter and Carter, 1882, p. 97; Benedict Arnold to Philip Schuyler, Reel 36, f. 84, The Philip Schuyler Papers, The New York Public Library; Governor Jonathan Trumbull to ?, Force, P.: *American Archives*, 9 vols. Washington, D.C., Clarke and Force, 1837-1853, 4th and 5th Ser., 5th Ser. I, p. 607.
 16. Dr. Samuel Stringer to Dr. Jonathan Potts, The Potts Papers, 2 vols. I, f. 70. The Historical Society of Pennsylvania (hereafter P.P.); Force, op. cit., I pp. 651-52; Potts to Horatio Gates, Reel 2, f. 110, The Horatio Gates Papers. The New York Historical Society (hereafter G.P.); and Unsigned Hospital Return from Fort George, October 9, 1776. Miscellaneous Bound Manuscripts, Massachusetts Historical Society.
 17. P.P., I, ff. 102-106, 108-119; Orderly Book of Horatio Gates Commanding the Northern Area of the United States from 10 June to 3 July, 1777, f. 24. The New York Historical Society; Force, op. cit., 4th Ser. 6, p. 280; Gates to George Washington, Papers of the Continental Congress. Roll 160, Item 161, ff. 13-14 (hereafter P.C.C.): Williamstown, Mass. Selectmen to Gates, Reel 2, f. 64, G.P.
 18. Force, op. cit., 5th Ser., I, p. 1146.
 19. Saffron, M.H: Rebels and disease: The New York campaign of 1776. *Acad. Med. N. J. Bull.* 13:107-18, 1967.
 20. Estimates are in Duncan, op. cit., pp. 130-31, 143, 148; Fleming, T. L.: 1776. *The Year of Illusion*. New York, Norton, 1975, p. 262; and Lesser, C.H.: *The Sinews of Independence*. Chicago, University of Chicago Press, 1976, p. xxxi.
 21. Morgan, J.: *Vindication of His Public Character in the Station of Director-General of the Military Hospital*. Boston, Powars and Willis, 1777, *passim*.
 22. Gibson, James E.: The role of disease in the 70,000 casualties in the American revolutionary army. *Trans. Stud. Coll. Physicians Phila.* 17:121-30, 1949.
 23. *Pennsylvania Evening Post*, June 5, 1777, p. 4.
 24. April 22, 1777, p. 1.
 25. Thursfield, H.: Smallpox in the American war of independence. *Ann. Med. Hist.* 4:315-16, 1942.
 26. P.P., vol. 2, ff. 339, 372, 384. See also Thatcher, J.: *A Military Journal During the Revolutionary War from 1775 to 1783*. Boston, Richardson and Lord, 1823, pp. 113-15.
 27. Duncan, op. cit., p. 237; P.P., 2, f. 273.
 28. Gates' request is in Mss. 2103, Fort Ticonderoga Museum Library. The Delegates' response is in Ford, W. C., editor: *Journals of the Continental Congress, 1774-1789*, 34 vols. Washington, D.C., Govt. Print. Off., 1904-1937, 9, pp. 870-71.
 29. Cited by Butterfield, L.H.: *The Letters of Benjamin Rush*. 2 vols. Princeton, Princeton University Press, 1951, I, pp. 195-96.
 30. Cited by Heiges, George L.: Letters relating to the continental military hospitals in Lancaster County. *Lanc. Cty. Hist. Soc.* 52:73-96, 1948, p. 94.
 31. Lesser, op. cit., p. xxxi.
 32. Block, H.: Medical conditions at Valley Forge. *N.Y. State J. Med.* 70:3010-12, 1970.
 33. Roark, R. S.: Historic Yellow Springs: The restoration of an American spa. *Pa. Folklore*, Autumn, 28-38, 1974.
 34. Griffenhagen, G. D.: Drug supplies in the American revolution. *Nat. Mus. Bull.* 225:110-33, 1961; Kremers, E.: The Lititz Pharmacopoeia. *Badger Pharm.* 22-24:1-70, 1938.
 35. Gibbes, R.W., editor: Reminiscences of William Read. In: *A Documentary History of the Ameri-*

- can Revolution*. 3 vols. New York, Appleton, 1853-1857, vol. 2, p. 257.
36. Lesser, op. cit., p. xxxi.
 37. Angelakos, P.: *The army at Middlebrook, 1778-1779*. *N.J. Hist. Soc. Proc.* 70:97-120, 1952.
 38. Lesser, op. cit., p. xxxi. See also Torres-Reyes, R.: *1779-1780 Encampment. A Sketch of Medical Services*. Washington, D.C., Nat. Park Serv., 1971, p. 30.
 39. Tilton, J.: *Economical Observations on Military Hospitals*. Wilmington, Del., Wilson, 1813, pp. 49, 55.
 40. Cited by Gibson, *Bodo Otto*.... p. 260.
 41. See Saffron, M.H.: *Surgeon to Washington, Dr. John Cochran (1730-1807)*. New York, Columbia University Press, 1977, pp. 62-76.
 42. P.C.C. Roll 101, Item 178, f. 97.
 43. Roll 85, Item 72, ff. 518-519, Ibid.
 44. Little information about army medical care in the South has been published. See Duncan, op. cit., pp. 310-58; Waring, J. I.: *A History of Medicine in South Carolina, 1670-1835*. Charleston, S.C., S.C. Med. Assoc. 1956, pp. 82-106, 340-43; and Davidson, C. G.: *Friend of the People. The Life of Peter Fayssoux*. Columbia, S.C., Med. Assoc. S.C., 1950, pp. 1-58.
 45. G.P., Reel 7, ff. 195, 203.
 46. Williamson to Hon. Thomas Benbury. In: *The State Record of North Carolina*, 30 vols., Clark, W., editor. Raleigh, The State of North Carolina, 1886-1914, vol. 15, p. 643.
 47. The Greene letters are in Greene's Letterbook, October 16-December 31, 1780, ff. 47-48; *General Correspondence*, 2 vols., vol. 2, f. 105. Letterbook, January 14-February 28, 1782, f. 26. The Nathanael Greene Papers, the Library of Congress.
 48. Greene to Fayssoux, February 25, 1782; Letterbook, *ibid.*, f. 88.
 49. The majority of Greene's papers are held by the William L. Clements Library at the University of Michigan. The correspondence which I have extracted from this collection indicates that Greene relied heavily on North Carolina politicians for medical supplies. Virtually no letters from Congress or to Congress from Greene on medical problems seem to be available for the 1781-1782 campaigns.
 50. Thacher, op. cit., p. 201.
 51. Peckham, H. H.: *The Toll of Independence*. Chicago, University of Chicago Press, 1974, pp. 131-38.
 52. Lesser, op. cit., p. xxxi; Gibson: *Role of Disease*.... pp. 126-27, estimated a 25% yearly casualty rate from sickness and wounds. Duncan, op. cit., p. 371, figured an annual loss of 20% of American troops.
 53. Except for the sickness rates of British troops at the siege of Boston (which varied from 19% in July 1775, to 23% in November, to 8% in March 1776, according to Cash, op. cit., p. 156), apparently no other published statistical data on the incidence of disease in the British army for this era is available except in scattered regimental returns. Out of a shipment of 3,800 troops from Cork, Ireland, to New York in August 1779, 100 died in passage, 800 landed with typhus, and the rest, explained General Sir Henry Clinton, infected the rest of his army "and sent about 6,000 of my best troops to the hospital." Cited by Willcox, W. B., editor: *The American Rebellion: Sir Henry Clinton's Narrative of His Campaigns, 1775-1782*. New Haven, Yale University Press, 1954, pp. 140-41. About 8% of the troops shipped to North America died en route and on the Caribbean passage the mortality rate usually reached 11%. See Syrett, D.: *Shipping and the American War, 1775-1783*. London, Athlone, 1970, p. 191; and Mackesy, P.: *The War for America, 1775-1783*. Cambridge, Harvard University Press, 1965, p. 526. Cantlie, General Sir N.: *A History of the Army Medical Department*, 2 vols. London and Edinburgh, Livingston, 1974, states (vol. 1, p. 155) that in 1781 the average percentage of British troops who were

seriously ill varied from 12 (New York), 19 (Virginia), 12 (South Carolina), and 28 (Georgia). Duncan, op cit., pp. 373-75, has attempted to make comparisons of deaths among the American, British, and German forces, but with questionable statistical data. The best information on Hessians is by Schmitz, R.: Hessian troops in the American revolution: Their Medical and Medical Care. In: *American Pharmacy in the Colonial and Revolutionary Periods. A Bicentennial Symposium*, Bender, C.A. and Parascandola, J., editors. Madison, American Institute of Pharmacy, 1977, pp. 37-47. He demonstrates that out of some 14,000 men

357 were killed in action and 4,626 died from illness. The Von Ditfurth Regiment that served for seven years lost, out of 633 officers and men, five in combat and 210 from disease.

54. Cited by Warren, E.: *The Life of John Warren, M.D.* Boston, Noyes, Holmes, 1874, p. 227.
55. Tilton, op. cit., p. 62.
56. Gilman, C. M. Military surgery in the American revolution. *J.M. Soc. New Jersey* 57:491-96, 1960.
57. Samuel Adams to Sally Adams, Mt. Independence, N.Y. *Dr. Samuel Adams Letters*. Reel 1, f. 45, Sol Feinstone Collection, Boston Public Library.
58. Thacher, op. cit., pp. 25-26.
59. P.P., vol. 1, f. 144.